

US Air Force

Environmental Restoration Program – Optimization and Sustainable Remediation

Dr. Javier Santillan
Air Force Center for Engineering and the Environment
E2S2
May 6, 2009

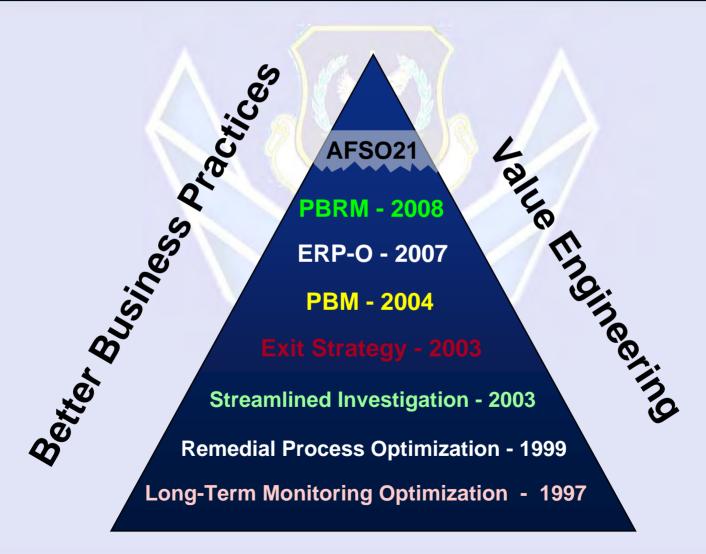
maintaining the data needed, and c including suggestions for reducing	ompleting and reviewing the collect this burden, to Washington Headqu uld be aware that notwithstanding ar	o average 1 hour per response, includion of information. Send comments a arters Services, Directorate for Inforty other provision of law, no person to the provision to the provision of law, no person to the provision of law, no person to the provision to the provision of law, no person to the provision to the provision of law, no person to the provision to the pro	regarding this burden estimate of mation Operations and Reports	or any other aspect of the 1215 Jefferson Davis	is collection of information, Highway, Suite 1204, Arlington			
1. REPORT DATE 06 MAY 2009			3. DATES COVERED 00-00-2009 to 00-00-2009					
4. TITLE AND SUBTITLE				5a. CONTRACT	NUMBER			
Environmental Res Remediation Envir	_	Optimization and S	Sustainable	5b. GRANT NUM	1BER			
Kemediation Envir	omnentai		5c. PROGRAM E	LEMENT NUMBER				
6. AUTHOR(S)				5d. PROJECT NU	JMBER			
				5e. TASK NUMB	ER			
				5f. WORK UNIT	NUMBER			
		odress(es) the Environment,JI	3SA	8. PERFORMING REPORT NUMB	GORGANIZATION ER			
9. SPONSORING/MONITO	RING AGENCY NAME(S) A	ND ADDRESS(ES)		10. SPONSOR/MONITOR'S ACRONYM(S)				
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)				
12. DISTRIBUTION/AVAIL Approved for publ	LABILITY STATEMENT ic release; distributi	on unlimited						
13. SUPPLEMENTARY NO Presented at the Ni held 4-7 May 2009	DIA Environment, I	Energy Security & S	ustainability (E2	S2) Symposi	um & Exhibition			
14. ABSTRACT								
15. SUBJECT TERMS								
16. SECURITY CLASSIFIC	CATION OF:		17. LIMITATION OF	18. NUMBER	19a. NAME OF			
a. REPORT unclassified	b. ABSTRACT unclassified	Same as Report (SAR)	OF PAGES 24	RESPONSIBLE PERSON				

Report Documentation Page

Form Approved OMB No. 0704-0188



Foundation for ERP-O





ERP-O Definition

Definition:

Environmental Restoration Program Optimization (ERP-O) is a comprehensive and systematic review of an installation's past, current and planned cleanup activities whose goal is to ensure protection of human health and the environment over the entire restoration life-cycle at minimal risk and optimal costs

ERP-O provides all the needed tools to manage risk and complies with AFSO21



ERP-O Flow Chart

Environmental Restoration Program Optimization Remedy Selection, Proposed Plan, and Record of No Further Action Response Complete Decision (ROD) Cleanup Confirmed Remedy Site Closure **NFRA** Site Closure in Place NFAP Preliminary Site Remedial Post-Closure Remedial Design Assessment/Site Remedial Action Long-Term Investigation/ (RD)/Remedial Action Care Investigation Feasibility Operations (RA-O) Monitoring Construction (RA-C) (Site Closed) (PA/SI) Study (RI/FS) **Investigation Process Remedial Process Optimization** Optimization **Technical Assistance Visits**



Investigation Process Optimization (IPO)

Definition:

An Iterative/Systematic Planning Approach for Evaluating Remedial Study Programs with the Goal of Improving Overall:

- ✓ Study Program Effectiveness
- ✓ Time and Cost to Achieve Site RIP Milestone
- ✓ Timely Feedback to Decision Makers

A component of the overall AFCEE ERP-O



Remedial Process Optimization (RPO)

Definition:

An Iterative/Systematic Planning Approach for Evaluating Existing/Proposed Remediation Processes with the Goal of Improving Overall:

- ✓ Control Effectiveness
- ✓ Site Cleanup Time and Costs
- ✓ Timely Feedback to Decision Makers

A component of the overall AFCEE ERP-O



Technical Assistance

Definition:

A Systematic Analytical Approach for resolution of regulatory, technical, contractual, programmatic issues

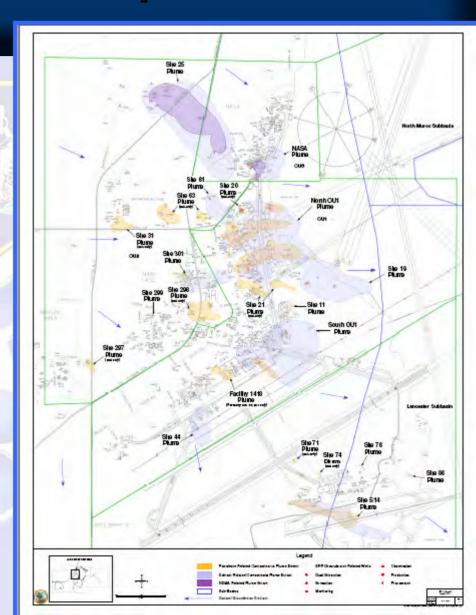
- ✓ Conceptual Site Models and Exit Strategies
- Decision Documents
- ✓ Contractual Strategies
- ✓ Decision Logic
- ✓ Background Studies

A component of the overall AFCEE ERP-O



Example Site: EAFB

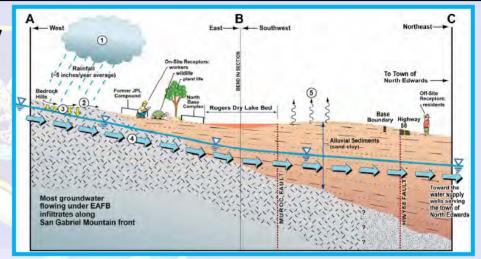
- **Edwards Air Force Base**
- Technical Impracticability waivers
- Base-related practices for over 50 years
- Several large plumes in complex geology including fractured bedrock
- > A variety of cleanup technologies
- Chemicals of Concern:
 - ✓ TCE, BTEX, MTBE, Perchlorate, NDMA, etc.

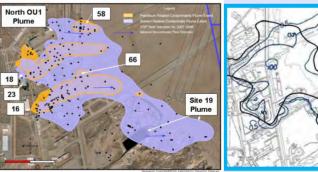




EAFB : ERP-O Team Recommendations

- Continue Technical Impracticability waivers where applicable
- Establish a base-wide LTMO process, build an LTMO decision tree (based on a DQOs), and share with the RPMs
- Prepare a detailed performance monitoring plan to ensure that remedy maintains effectiveness and efficiency
- Consider an overall strategy that does not require perpetual extraction well network to contain the down-gradient migration of the plume





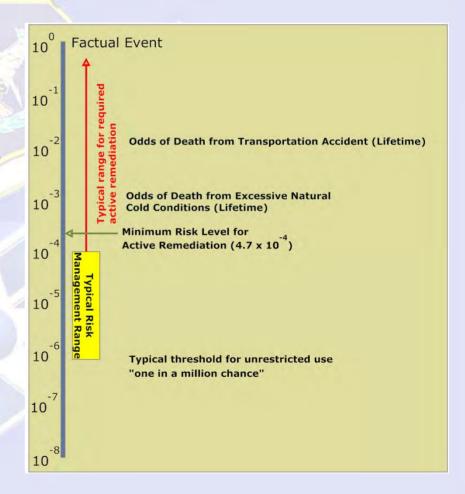




Example: Risk to Workers

Which site at which facility

- ➤ By operating the groundwater treatment system:
 - √ Risk to workers 1 X10⁻³
 - √ Risk to community 1 X10⁻⁴
- ➤ Risk to HH & Eco from ground water 1 X10⁻⁶
- ➤ Is active remediation really justified?
 - ✓ Alternative to remediation





Resources Utilized vs. Resources Protected

- Evaluation of resources being protected
- > Technology vs. Energy Use
- ➤ Is active remediation really justified?
 - ✓ Alternative to remediation

Groundwater restoration

California installation

Consuming 1.5M KWH/yr

Removing < 50 grams of TCE

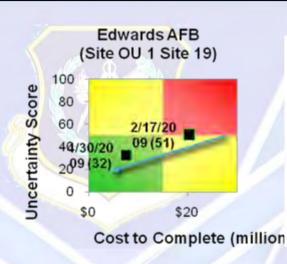
\$3.6M/lb removed

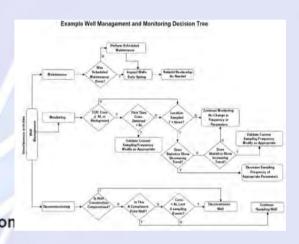


ERP-O Tools

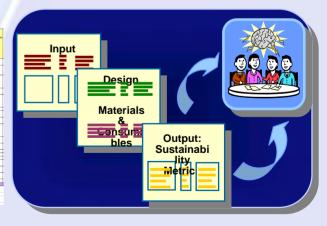
Support Tools

- ✓ Uncertainty Tool
- √Sustainability Tool
- ✓ Performance Tracking
- ✓ Recommendation Tracking
- **✓LTMO**





	2000 Blood Finding American ARE SEC Plant Streetment New York	*	Bostoniki er/siter	Britani Fantanida Kas	94	Erimonal Impianostrina Data	Input on Plais to Hereo Hobbs and the Environce of	Input or Tinate Sits Circuis	Francisco Joseph Preffe Jer	Comungues Nacemarilans	Downstall Jan Annale Was Ex-	Resonantivine Present of Appending Regulary YM - 10 ISA	Goder Goder Avoid 1901 1 Sta
PIONANAMA	Propert December CSM (concretitation), condition, contract (for not set a management condi-	Bereidoffs egon Ville	75 8 61	Planing	RFOPhys I	5900	Res	Suta				0	0
F108Y#A7882	Parceré de litées lapers, reduical appressitées, sud-suit disabujus to document les literature (accrécion le s management management	Buseidulfe ogsæVilds	798H	Plensing	RPOPhys. I	3000	Nec	Shertos					0
r sanyevzeno	For heavy againing tion of the contract [TM] Optimization (CPATE) as monitoring wells seconding to the orients described in the obta- quality also stress (CPATE) in 8,449.	Buneidulin ogsa Vide	(Mudelius)	Flaming	PHO and Burn	10:0	Leave Flick	Sherton					0
P105YFAP84	Dendup Eak Strategics for all sites (including a class definition of the andpoint)	Donaldoffs agon Vide	Middleni	Planing	PRO set Burn	8008	Nec	Sheetn					0
PYDONEWERS	Proper CSM for each size sociolog VF consoling others (SE 5,004) SS, FAA-0, LF II, residential ency CU2, MW29-25 and SV30 ency, CU4, MW-105, CU EVM-1101	Duswidelle også Ville	Henu	Plening	IPOPies I	4000	See	Sata				٠	
F108YPAP046	Develop-skir-speak's CSMAv EMOU	0V9U	Specu	Plunky	PSIO and Dure	4000	Rear	Shate				0	0
FYSSAPAPBOS	OUt Valder and lark selets or retimends and option if model	OUI	fBrack	Planing	PM0 set flux	1005	Nec	Nec					0
FISSYPARSO	Zertere funior optibization to miles Zeredente Assitation OUI Cassimira etted sion OUI CSM sa	0.0	18ved	Plenky	1910 and Dark	1010	Nec	None				0	0
F130VFHFB3	OUT Coaples o stantate OUT CSM or document cornet conditions and focus additional optimization with the Ak in closed focus or trapping for other phospholic CSMs.	ou	(Druck	Plening	PSIO and State	4000	Nonc	None					0
PIDOVENERS	OLD: Build's S-D CSM're opinistic sumoier	000	Missouri	Plyming	PRO set flux	8008	Lower Flick	Shorton					0
FIRENDARES	OUZ Register/RB champ lands to applicable audiosecurios	Utile	Shakkeni	Physing	1910 md Barr	1010	teer Rick	Suta				0	- 0
	OLD: Musticeing for Mit payametric face:	060	15fuhbbuni	Plyming	MID will floor	Park.	Resi	Mac				0	0
FYXMANDE	Device She brooks fait Statuse	0.5	334hu	Plymbo	2550 and Bucc	10/0	Beer	Sins.				0	0
FYDOMPWTD'S	Danding program removes for risk	OUS	39861	Planing	PSNO and Days	4008	Next	Storton				0	0
FISHVAVESS	December transfers of objectives to Microphic Shimbories 16th, Boyles, co.87	0.5	JG8h;	Plening	1990 and State	1009	Nec	None				0	0
CONTRACTOR	Country for exergity of each shreading is country and a femble active analysis for CVTP	0.5	25861	Planing	PHO and Store	100	Nonc	Siortos				0	0
FIORVENER	Document management retireds, it continue, legic to proper microtrational terrational	0.5	3584	Huning	PHO and Dark	4000	Rees	Since				0	0
										0	-		
for Student 1	Place 2 gent's sun professionate delices.			1									
in Phidne	Plan Efeld each base.												
ten Godon C	Phase 2 technical studies or technique industrial	drivani cassis	(softeday)										
bu Shishara	Carcelos, permones, or completed recommends												
le Brather	No deplected only business and	-,-		1									

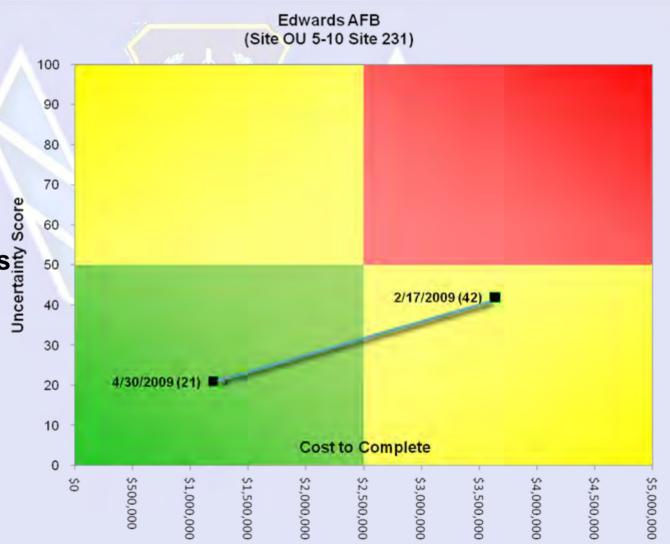




Uncertainty Analysis Tool



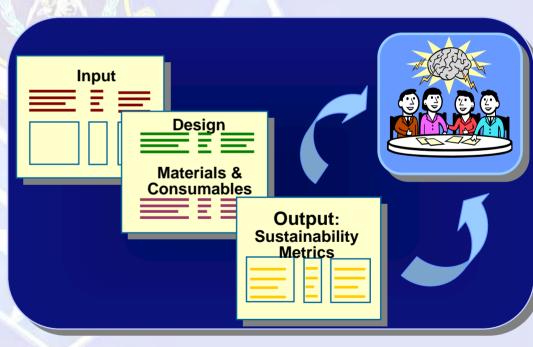
- Site-specific information
- Estimates based on ERP-O team recommendations
- recommendations







- ➤ SRT estimates sustainable metrics for specific technologies
 - ✓ Excavation
 - **✓** SVE
 - ✓ P&T
 - ✓ Enhanced Bioremed
- Sustainable metrics developed
 - ✓ CO₂
 - ✓ Energy Consumed
 - √ Technology Cost
 - √ Safety/Accident Risk

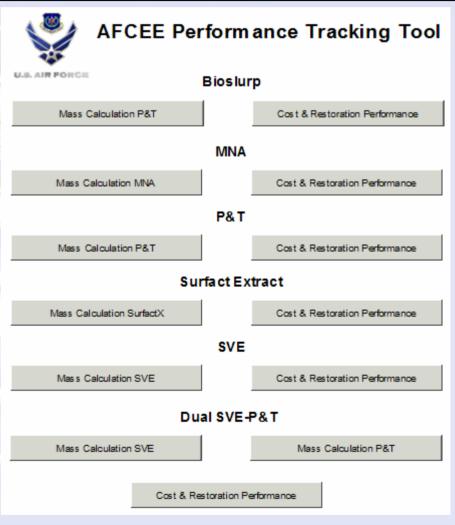




Performance Tracking Tool

Which site at which facility

- Track Remedy's Performance and Cost
 - ✓ Projected vs. actual for contaminant reduction
 - ✓ Projected cost vs. actual
- Normalized output for easy comparisons
- Six Technologies
 - ✓ Bioslurping
 - ✓ MNA
 - **√** P&T
 - ✓ Surfactant Extraction
 - **✓** SVE
 - ✓ Dual SVE & P&T



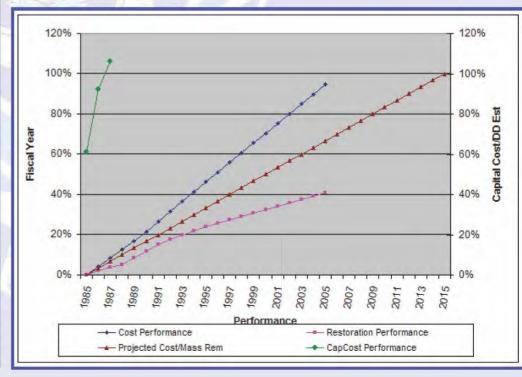




by	ital Cost Fiscal Year	Ma	eration & intenance t by Fiscal Year	Projected Costs/Mass Removed (from DD)	Capital Cost as Percent DD Est.	O&M as Percent of CTC	Total Pecent Mass Removed	
\$	195,000	\$		0%	61%	0%	0%	
\$	100,000	\$	290,000	3%	92%	4%	2%	
\$	45,000	\$	290,000	7%	106%	8%	4%	
		\$	300,000	10%		13%	5%	
		\$	310,000	13%		17%	8%	
		\$	305,000	17%		21%	12%	
		\$	375,000	20%		27%	15%	
		\$	340,000	23%		32%	18%	
		\$	340,000	27%		36%	20%	
		\$	340,000	30%		41%	22%	
		\$	340,000	33%		46%	24%	
		\$	340,000	37%		51%	26%	
		\$	340,000	40%		56%	27%	
		\$	340,000	43%		61%	29%	
		\$	340,000	47%		66%	31%	
		\$	340,000	50%		70%	32%	
		\$	340,000	53%		75%	34%	
		\$	340,000	57%		80%	36%	
		\$	340,000	60%		85%	37%	
		\$	340,000	63%		90%	39%	
		\$	340,000	67%		95%	41%	
				70%				
				73%				
				77%				
				80%				
				83%				
				87%				
				90%				
				93%				
				97%				
				100%				

Total Mass at RA-O Start-Up (II	30000
Cost-To-Complete (CTC) (\$)	\$ 7,000,000
DD Capital Cost Est	\$ 320,000
Impacted Acres	23
Acre-ft of groundwater impacted	265
RA-O Start Year (from DD)	1985
RA-O Completion Year	2015

		To Date		Estimated total cost		
Cost/Acre	\$	288,261	S	117,832		
Cost/Acre feet	5	25,019	- 5	10,227		
Cost/lb removed	\$	541				
Total O&M Costs	\$	6,630,000				
Total Mass Removed		12,263 lbs				
Portion of DD Mass Rem		40.9%				







Which site at which facility

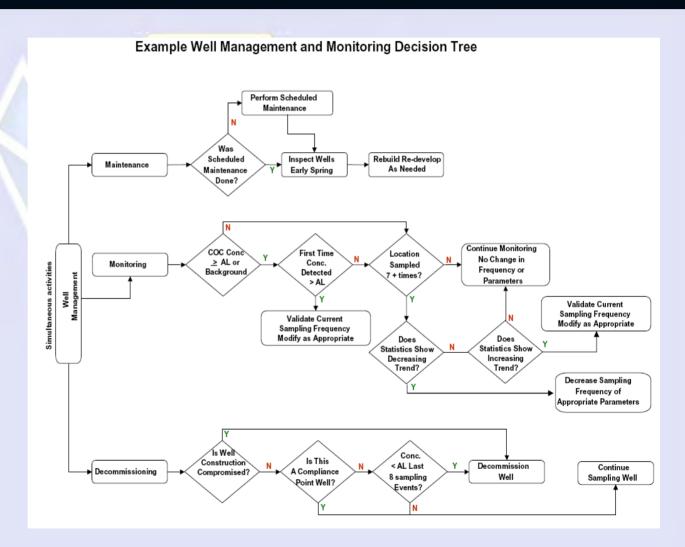
- Track Recommendations (ERP-O Phase IV)
- ➤ Phase II, III
- > Track
 - ✓ Implementation
 - ✓ Risk reduction
 - **✓** RC Acceleration
 - ✓ Total Investment
 - ✓ Cost avoidance
 - ✓ ROI

	Q P												
н	2006 Phase I Wrigh-Patterson AFB RPO Report Recommendations	Site	Recommendati on Author	Status of Recommenda tion	OPR	Estimated Implementation Date	Impact on Risk to Human Health and the Environme nt	Impact on Time to Site Closure	Estimated Cost Avoidance Annual/Life Cycle	Cost to Implement Recommendations	Documented Cost Avoidance Annual/Life Cycle	Recommendations Presented and Approved by Regulators Y/N = 1/0 N/A	Implementat Contract Awarded Y/N = 1/0 N/A
FY08WPAFB01	Prepare Basewide CSM (consolidated, concise, current) for use as a management tool	Basewide/Pr ogram Wide	JGibbs	Planning	RPO Phase II	3009	None	Shorten				0	0
FY08WPAFB02	Record decision inputs, technical approaches, and exit strategies to document institutional knowledge in a management summary	Basewide/Pr ogram Wide	JGibbs	Planning	RPO Phase II	3909	None	Shorten				0	0
FY08WPAFB03	For future optimisation efforts, perform LTM Optimisation (LTMO) on monitoring wells according to the criteria described in the data quality objectives (DQOs) in QAPP	Basewide/Pr ogram Wide	SMadabhushi	Planning	PMO and Base	1010	Lower Risk	Shorten				0	0
FY08WPAFB04	Develop Exit Strategies for all sites (including a clear definition of the endpoint)	Basewide/Pr ogram Wide	SMadabhushi	Planning	PMO and Base	4003	None	Shorten				0	0
FY08WPAFB05	Prepare CSM for each site exceeding VIP screening criteria (BS 5; BIdg 53; FAA-B; LF 8, residential area; OU 2; MW20-23 and SV08 areas; OU 4, MW-12B; OU 10 MW-11S)	Basewide/Pr ogram Wide	RKutzman	Planning	RPO Phase II	4009	None	Shorten				0	0
FY08WPAFB06	Develop site-specific CSM for GWOU	GWOU	JSpencer	Planning	PMO and Base	4003	None	Shorten				0	0
FY08WPAFB07	OU1: Validate need for leachate extraction wells and optimize if needed	001	SBrock	Planning	PMO and Base	4009	None	None				0	0
FY08WPAFB08	Perform further optimization to reduce groundwater monitoring	001	SBrock	Planning	PMO and Base	1010	None	None				0	0
FY08WPAFB9	OUI: Complete a stand alone OUI CSM to document current conditions and focus additional optimization until the site is closed (use as a template for other site-specific CSMs)	0U1	SBrock	Planning	PMO and Base	4903	None	None				0	0
FY08WPAFB10	OU2: Build a 3-D CSM to explain the anomalies	002	SMadabhushi	Planning	PMO and Base	4009	Lower Risk	Shorten				0	0
FY08WPAFB11	OU2: Negotiate RB cleanup levels as applicable and appropriate	002	SMadabhushi	Planning	PMO and Base	1010	Lower Risk	Shorten				0	0
FY08WPAFB12	OU2: Monitoring for NA parameters less	002	SMadabhushi	Planning	PMO and Base	NA	None	None				0	0
FY08WPAFB13	Develop Site-Specific Exit Strategy	005	JGibbs	Planning	PMO and Base	10:10	None	None				0	0
FY08WPAFB14	Develop program summary for risk	005	JGibbs	Planning	PMO and Base	4003	None	Shorten				0	0
FY08WPAFB15	Document transition of objectives to life cycle minimization (risk, duration, cost)	OUS	JGibbs	Planning	PMO and Base	3009	None	None				0	0
FY08WPAFB16	Consider low energy treatment alternatives in remedy selection/alternative analysis for GWTP	OUS	JGibbs	Planning	PMO and Base	1010	None	Shorten				0	0
FY08WPAFB17	Document management rationale, decisions, logic to preserve institutional knowledge	005	JGibbs	Planning	PMO and Base	4009	None	None				0	0
									0	0	0	0	0
Di Okadia a	Phase 2 general conceptual recommendations.								U		U	U	U
Blue Shading =	Phase 2 general conceptual recommendations. Phase 2 field work items.												
Tan Shading =		1.000											
Green Shading =	Phase 2 technical studies or tasks (may include a		e collection J.										
Grey Shading =	Canceled, postponed, or completed recommends	ation											
No Shading =	No shading indicates base/PMO OPR												



Monitoring Decision Logic

- Purpose of each well?
- > CoC trends
- Statistical analysis
- Rational recommenda tions





lea, ualer

Monitoring Decision Logic

Wellio	5.	orreal mpling rgarang	learliady, hashyround, sompliance modificing, scaleguell, plane modificing, close	Targel Analgles/Melb ad Je.g., 82685, MHA, field parameters, els.[# Sample results in biologic record and must record result my/L #, TCE, PCA	Qualitation Connecteding Teendo HoofWello Descessing in Plane	Pelrelially spalially reductant or successary	Resourced etalistical temporal tered analysis?	for folier modificing [e.q., forgonoug, analyte fiel, nampling mothed, command]	Ralineale for economycelaline	Cameral
AP-374	somi	-annual	rontry	VOCrby 8260B	21, ND, ND	Docroaring/Stabl o	Unnocossary	No	NO (Abandan)	Dawn gradient of sentry well AP4019	All non dotactrzinca incaption (21 rampling rounds)
AP-401	romi	-annual	PM.		19, 17, 1.3	٥	AP4017 & AP4525	No		Plumostability is confirmed	Only TCE romains above MCLs after 19 rounds of sampling
	L			VOCarby		Docroaring/Stabl			YES (5 yr, TCE		
AP-401	som	rannual	PM	8260B VOCaby	18,1200,280	o Docroaring/Stabl		No		Main plume manitaring well To manitar plume stability and	Principal indicator of progress towards RAOs
AP-4019	rom!	-annual	contro	\$260B	18, ND, ND	pecrearingratabl		No		behavior	Sontry well to ensure the plume stability
-101			,	VOCa by		Docroaring/Stabl			mi stramy		
AP-434	romi	-annual	rontry	\$260B	7, 15, nd		Unnocerrary	No	NO (Abandan)	Plumo ir stablo	Sontry well har a well upgradient to monitor AP4525
				VOCz by		Decrearing/Stabl					
AP-434	romi	-annual	rontry	8260B VOCrby	7,nd,nd	o Docroaring/Stabl	Unnocorrary	No	NO (Abandon)	Plumostability is confirmed	No dotoctions of CoCs for over five years of sampling
AP-435		annual	Fanhey	8260B	7, nd, nd	Decrearings Stabi	Unnecessary	No	NO (Abandon)	Plumostability is confirmed	TCE, PCEND for ton yours
11. 422	1	annaan	a poisty.	90Crby		Decrearing/Stabl	Onit Classify	11.0	YES (5 yr, TCE	rampa capine) a cammino	TOE, I SETIE I AL TON JUNE
AP-452	somi	annual	PM	8260B	5,600,120	6		No	%PCA only)	Plume manitoring	Principal indicator of progress towards RAOs
				VOCaby		Docroaring/Stabl	Spatially rodundant with			E NOVE -	The Continue of the Continue o
AP-455	somi	-annual	PM	\$260B	3,19,120	0	AP4017 & AP4525	No	NO (Abandan)	Plumo ir stablo	TCE can be manitared from the well: AP4017 & AP4525
		0.535.534	CORE	VOCaby 8260B	Charles Control of the Control	Docroaring/Stabl	11	era l	MOVEL IN	D1	N 13 V 20 0
HF-924	zom)	-annual	rentry	VOCrby	1,nd,nd	Docesarina/Stabl	Unnocorrary Spatially rodundant with	No	ITO (Mbanaan)	Plumostability is confirmed Up gradient of sentry manitoring well	No dotections of CoCs
AP-374	semi	-annual	PM	8260B	14,56,9	0	AP4017 % AP4525	No	NO (Abandan)		All COCr bolow action lovely except for TCE & PCA
			ridogradion			Docroaring/Stabl			The second	Up gradient of sentry monitoring well	
AP-374	romi	rannual	ŧ	8260B	17, 29, 25	٥	Unnecessary	No	NO (Abandan)	AP3748	All COCr bolou action lovelr except for TCE & PCA
				VOCaby		Decreasing/Stabl		1.	YES (5 yr, TCE		
AP-37	semi	rannual	rentry May	8260B VOCrby	16,250,2.5	o Docroaring/Stabl		No	@PCA enly)	Manitaring/Sentry well	Sontry woll to onsure the plume stability
AP-274	· comi	-annual		8260B	18, ND, ND	v necesariudi Seasi	Unnecessary	No	NO (Shandan)	Upgradient clean well	
213	1	41111441	ap 41 dallerin	VOCa by		Decreasing/Stabl	Onne coast)	11.0	YES (5 yr, TCE	opqi aaton ciban abn	
AP-398	somi	-annual	Upgradient	8260B	14, 9.8, 2.5		Unnecessary	No	&PCA anly)	Plumostability is confirmed	Maflau detectionssince 2000
100				VOCa by	a transfer of the con-	Docroaring/Stabl		Lo Toronto	Walter State of the	American State of the State of	
AP-398	somi	-annual	rontry	8260B	18, ND, ND	6 1 10 11	Unnocorrary	No	NO (Abandan)	Plumostability is confirmed	Na dotoctians sinco 2000
Ap. 200		-annual	БМ	VOCrby 8260B	17,2100,720	Docroaring/Stabl	Spatially rodundant with AP4017 & AP4525	No	NOTAL I	Plume ir stable	Waltran aithorsida AP3989 and AP4519 will suffice
ME -230	1 som	annual	ret	VOCarby		Docroarina/Stabl	Spatially redundant with	110	IIO (Mbanadh)	r iume u Stable	TO BE AN OIS NOT 2190 ME 2797 GRIG ME 4217 MINISUFFICE
AP-398	romi	-annual	PM		17,350,53	0	AP4017 % AP4525	No	NO (Abandan)	Plumostability is confirmed	Other wells in the main plume area will continue to monitor
Date of the last				VOCa by		Docroaring/Stabl	Spatially rodundant with				
AP-398	somi	-annual	PM	8260B	16,250,27	0	AP4017 & AP4525	No		Plume ir stable	Other wells in the main plume are a will continue to monitor
			BU	VOCarby COCCAR		Docroaring/Stabl				Tomonitor plumostability and	TCE and PCA can be manitared in this well to make future cleanup complete
AP-35	semi	-annual	rm	\$260B VOCaby	18,920,200	e Decrearing/Stabl		No	⊗PCA enly)	behavior	decirion
AP-435	Serie	-annual	rontry	8260B	7, nd, nd	energen indiagabl	Unnocorrary	No	NO (Abandes)	Down gradient clean well	Na dotoctionssince 2000
			Upgradient			Docroaring/Stabl		No		Plumostability is confirmed	Upgradientwell
			Upgradient			Docroaring/Stabl		No		Upgradient clean well	Na detections ever
AP-451:	som	-annual	ridogradion		15, ND, ND	Decrearing/Stabl	Unnecessary	No		Sidegradient clean well	No dotoctions over
						Docrearing/Stabl		2.5	YES (5 yr, TCE	No. of the second secon	TCE and PCA can be manitared in thir well to make future cleanup complete
AP-45	somi	-annual	PM		6,1000,350	6 1 to 10	C	No	⊗PCA anly)	Main plume manitaring well	docirion
AP-455	zomi	-annual	РМ		3,1000,330	o o	Spatially rodundant with AP4017 & AP4525	No	NO (Abandan)	Plumostability is confirmed	Other wells in the main plume area will continue to manuar



ERP-O Supporting Agencies

- >ITRC Interstate Technology Regulatory Council
 - ✓ ITRC Team Members become Advocates for the Process
- >USGS US Geological Survey
 - ✓ Support CSM and fate and transport model oversight
- **➤ USACE US Army Corp of Engineers**
 - ✓ Additional DoD Technical Expertise



ITRC RRM and GSR Teams

- >ITRC Interstate Technology Regulatory Council
- ➤ AFCEE is providing in-kind support to several ITRC teams including Remediation Risk Management (RRM) and Green & Sustainable Remediation (GSR) Teams
- ➤ AFCEE Funds and Supports ITRC RPO Team Members to Participate on ERP-O Reviews



ITRC RRM & GSR Team Products

- > RPO Products on www.itrcweb.org
 - ✓ RPO and PBEM Technical Guidance Documents
 - ✓ RPO related Fact Sheets
 - ✓ RPO and PBEM Internet-based Trainings
- > ITRC RRM Team Products
 - ✓ Technical & Regulatory Guidance Document (Fall '09)
 - ✓ Internet-based Training on RRM (Early 2010)
- > ITRC GSR Team Products
 - ✓ Status summary of GSR practices
 - ✓ State survey of GSR practices
 - ✓ Technical and Regulatory Guidance Document (2010)
 - ✓ Internet-based Training on GSR (2011)



Incorporating Sustainable and Green Practices into ERP-O

- ➤ AFCEE PBM Guidance document is being developed to reflect ERP-O Strategies and sustainable remediation
 - ✓ PBRM a green/sustainable process is also being revised
 - ✓ PBM, ERP-O, IPO, RPO, PBRM all have a common goal
 - Sustainable, green, & cost effective RIP by 2012
 - Accelerate clean closure
- > Investigation Processes
 - ✓ Use more sustainable approaches for characterization
 - ✓ Use Triad with a green perspective
- > Land Use and Institutional Controls
 - ✓ Developing sustainable strategies with the active participation from stakeholders



Integrity-Service-Excellence